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THESIS

THE NUCLEAR-ARMED TOMAHAWK CRUISE MISSILE: ITS POTENTIAL UTILITY ON UNITED STATES AND UNITED KINGDOM ATTACK SUBMARINES

by

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In July 1998, Britain published its Strategic Defence Review (SDR). The SDR outlined significant changes for Britain's nuclear weapons program and formalized the policy of sub-strategic deterrence using the Trident missile. It is unprecedented for a nuclear power to have consolidated its strategic and sub-strategic nuclear forces into a single system. The benefits offered by the British choice might be enjoyed for only a short time. The British have slashed their nuclear forces and eliminated the range of options previously available to their national command authority. Dependence on a single delivery system could result in the inability to respond to crises, to act autonomously, or to negotiate effectively with other nuclear weapon states.

This thesis analyzes the benefits that nuclear Tomahawk could provide the British. Since the United States owns the system, the future of the nuclear Tomahawk in the American arsenal is crucial to any British decision to adopt it or a similar system. An unmanned nuclear cruise missile weapon offers many advantages in today's security environment. The United States should retain nuclear Tomahawk and Britain, with its mature maritime force, should consider acquiring a similar capability. The elimination of nuclear Tomahawk from the U.S. arsenal would be a mistake.

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THE NUCLEAR-ARMED TOMAHAWK CRUISE MISSILE: ITS POTENTIAL UTILITY ON UNITED STATES AND UNITED KINGDOM ATTACK SUBMARINES

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In July 1998, Britain published its Strategic Defence Review (SDR). The SDR outlined significant changes for Britain's nuclear weapons program and formalized the policy of sub-strategic deterrence using the Trident missile. It is unprecedented for a nuclear power to have consolidated its strategic and sub-strategic nuclear forces into a single system. The benefits offered by the British choice might be enjoyed for only a short time. The British have slashed their nuclear forces and eliminated the range of options previously available to their national command authority. Dependence on a single delivery system could result in the inability to respond to crises, to act autonomously, or to negotiate effectively with other nuclear weapon states.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

In support of the 1991 START I negotiations, the United States made several concessions to Russia concerning nuclear sea-launched cruise missiles. The United States agreed to limit the inventory of nuclear sea-launched cruise missiles, to place no more than one warhead on each missile, and to provide Russia with information concerning nuclear cruise missile deployments. The United States has provided annual written statements to Russia confirming that no nuclear sea-launched cruise missiles are deployed on U.S. Navy warships.

In 1994, the Department of Defense's Nuclear Posture Review (NPR) made several recommendations that President Clinton approved. The NPR recommended retaining the submarine-launched nuclear Tomahawk cruise missile. Recently, however, various factors, such as costs and revised assessments of requirements, have encouraged the Navy to reconsider the need for nuclear Tomahawk.

In 1998 Britain completed a comprehensive review of its security requirements. The results of this review were published in July 1998 as the Strategic Defence Review (SDR). The SDR outlined significant changes for the nuclear weapons program and confirmed the previous government's policy of sub-strategic deterrence using the Trident missile. The changes are designed to reduce the size of the nuclear arsenal to the minimum level required to meet British security requirements.

This thesis evaluates whether the British may have reduced their nuclear forces too much and whether the Tomahawk cruise missile might be a desirable nuclear delivery option for the British. It is unprecedented for a nuclear power to have consolidated into a single system its strategic and sub-strategic nuclear weapons capability. The advantages

gained from this consolidation might exist for only a short time. The British have slashed their nuclear forces and eliminated the range of options previously available to their national command authorities. Dependence on a single delivery system could result in the inability to respond to crises, to act autonomously, or to negotiate effectively with other nuclear weapon states.

This thesis identifies the benefits that nuclear Tomahawk could provide the British. Since the United States owns the system, estimating the future of the nuclear Tomahawk in the American arsenal is crucial to any British decision to adopt it or a similar system. The thesis also compares British and American viewpoints on the merits of the nuclear Tomahawk. The comparison examines the advantages and disadvantages of nuclear Tomahawk, and throws light on its potential utility for Britain.

The special relationship between Britain and the United States plays a crucial role in nuclear policy decisions. Nuclear Tomahawk is currently under intense scrutiny from the U.S. Navy and the entire national defense establishment. However, the nuclear Tomahawk's advantages complement the capabilities being designed into the future British and American submarine fleets. It would be imprudent to eliminate the nuclear Tomahawk from the U.S. arsenal to save a few dollars today, given the intrinsic political and strategic merits of the system.

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I. INTRODUCTION

The British government outlined its vision for the future of its armed forces in the July 1998 Strategic Defence Review (SDR).[1] The SDR introduced several major changes in the capability of the Royal Navy. The Navy will now focus on projecting power ashore and the submarine force will assume all operational nuclear weapon responsibilities. The transformation will be accomplished in the long term by integrating large fixed-wing aircraft carriers into the fleet and in the short term by integrating the Tomahawk cruise missile into the attack submarine force. Placing all nuclear weapon employment options in the ballistic missile submarine force is a significant transition that suggests the time is ripe to review Britain's nuclear deterrence policies.

Since April 1998 the only active nuclear system remaining in the British arsenal has been the submerged launch Trident missile system. The SDR confirmed that the British intend to retain only a single method of delivering nuclear weapons. Also, the British nuclear arsenal will be reduced to fewer than 200 warheads with a maximum of 48 on each ballistic missile submarine.[2] The British reserved the right to develop additional nuclear capability if international conditions warrant. The British could bolster their ability to project power ashore by adopting the nuclear Tomahawk cruise missile. This choice would stay in concert with keeping nuclear weapons on naval platforms. It would also offer a way to project power ashore until their first large aircraft carrier is available. British policies since 1995 under Conservative and, since 1997, Labour

[1] United Kingdom Secretary of State for Defence, *Strategic Defence Review*, July 1998.

[2] United Kingdom Secretary of State for Defence, *Strategic Defence Review*, July 1998, Paragraphs 64, 67.

governments make the likelihood of the United Kingdom adopting the nuclear Tomahawk as a sub-strategic delivery device for deployment on attack submarines doubtful.

Several factors make reviewing the Tomahawk option a timely undertaking. Dependence on a single nuclear weapon system could become a cause for concern. Would a Trident missile be used in a sub-strategic role, for example, as a response to a chemical or biological weapon attack? Would a Trident missile be used to deliver a single warning shot to indicate Britain's willingness to escalate a dispute? Or would the use of a Trident missile be mistaken by an opponent for a full-scale strategic attack that would prompt immediate retaliation?

Using a submarine-launched ballistic missile to support both strategic and sub-strategic assignments is a new policy for the British. This policy resulted from the British desire to satisfy both requirements with a single delivery system, given the large technical and financial investment made in Trident. The proposed strategy has two potential weaknesses. First, a large ballistic missile like Trident, with a 100-kiloton yield,[3] has not been operationally employed in a sub-strategic role; its sub-strategic deterrent credibility remains untested and uncertain.[4] Is it feasible to use such a presumably powerful warhead for a limited contingency? According to an unofficial source, the British Trident warhead might possess a variable yield capability with the ability to select a yield as low

[3] Sublette, Carry, "Nuclear Weapons Frequently Asked Questions," Internet, Available from http://www.milnet.com/milnet/nukeweap/Nfaq7.html, Accessed 21 September 1998, Paragraph 7.2.3.2.

[4] Johnson, Rebecca, "British Perspectives on the Future of Nuclear Weapons," The Henry L. Stimson Center, January 1998, p. 24-25.

as one kiloton.[5] Mr. George Robertson, the Secretary of State for Defense, did not refer to specific yields, but stated that "The UK has some flexibility in the choice of yield for the warheads on its Trident missiles."[6] Second, a warning shot might create confusion because it is a high-risk tactic.[7] Would it be clear to the party under attack and to outside observers that the Trident missile was being used in its sub-strategic role?

Britain's desire to change the complexion of nuclear deterrence by making the components and procedures used to deter more transparent and by placing special emphasis on sea-based systems also has been evident in other Western nations and NATO. In July 1990, President Bush announced in the London Declaration that "NATO in the new Europe will adopt a new strategy making its nuclear forces truly weapons of last resort."[8] In September 1991, the United States limited its nuclear weapons based in Europe to a reduced number of gravity bombs. President Bush's September 1991 initiative also removed all non-strategic nuclear weapons from United States naval vessels. Bush also stated "that under normal circumstances, our ships will not carry nuclear weapons."[9] In November 1991, NATO announced in its new strategic concept that "the fundamental purpose of the nuclear forces of the Allies is political: to preserve

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[5] Sublette, Carry, "Nuclear Weapons Frequently Asked Questions," Internet, Available from http://www.milnet.com/milnet/nukeweap/Nfaq7.html, Accessed 21 September 1998, Paragraph 7.2.3.2.

[6] United Kingdom, House of Commons, Written Answers, Column 724, Paragraph 35198, 19 March 1998.

[7] Johnson, Rebecca, "British Perspectives on the Future of Nuclear Weapons," The Henry L. Stimson Center, January 1998, p. 24-25.

[8] United States Department of State, "NATO Transformed: The London Declaration," Bureau of Public Affairs, Selected Document 38, 6 July 1990.

[9] SECDEF Washington DC, Naval Message, Subject: Speech by President George Bush, 272236Z SEP 91.

peace and prevent coercion and any kind of war."[10] The U.S. Defense Department in its September 1994 Nuclear Posture Review recommended that the United States "retain the option to deploy TLAM/N on attack submarines" (although none are currently deployed, they could be deployed if needed).[11] During the March 1997 Helsinki Summit, Presidents Clinton and Yeltsin agreed "their experts will explore, as separate issues, possible measures relating to nuclear long-range sea-launched cruise missiles and tactical nuclear systems" in the next round of Strategic Arms Reduction Talks.[12] Given these recent changes, why did the U.S. NPR choose to maintain a non-strategic nuclear capability on submarines?

Sea-based nuclear systems provide a unique set of capabilities, especially when employed from a nuclear-powered submarine. These capabilities include the ability to undertake independent action without the need for foreign bases because all operations are conducted from the high seas, the ability to deploy rapidly to forward positions and to remain on station for extended periods of time with little added logistical support, the option of prepositioning without a visible presence, and the established effectiveness of existing weapons in conventional battle. Sea-based systems are expensive to counter because the launch platforms are mobile and because planning to meet every scenario in which naval weapons could be employed is at best complicated. These qualities result in

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[10] North Atlantic Treaty Organization, "The Alliance's Strategic Concept," *NATO Handbook*, October 1995, p. 247.

[11] United States Department of Defense, *Nuclear Posture Review*, 18 September 1994.

[12] The White House, Office of the Press Secretary Helsinki, Finland, Joint Statement on Parameters on Future Reductions in Nuclear Forces, 21 March 1997.

a credible conventional and nuclear land-strike deterrent being supplied by a submarine carrying Tomahawk cruise missiles.

The Tomahawk Missile System is an autonomous, long-range strike weapon that can deliver a variety of payloads. The system was developed in the early 1980s to deliver nuclear and conventional munitions. It is difficult to differentiate between nuclear and conventional payloads on individual weapons without a close-up inspection of the weapon. The system was first used operationally in its conventional role during Operation Desert Storm in January-February 1991 and most recently in August 1998 in Afghanistan and Sudan when the United States responded to terrorist bombings against its Embassies. Continued conventional development produced the Tactical Tomahawk and future nuclear program applications will include the AN/BGS-1 Weapons Launch System. This system provides a capability to equip virtually any submarine with nuclear-armed Tomahawk missiles. Tomahawk continues to improve and to be integrated into combined joint military operations.

The first demonstration of combined (U.S.-Allied) integration in the domain of sea-launched cruise missiles was the British purchase of conventional Tomahawk missiles in 1996 with an in service date of 1998. The British announced in the SDR that all ten of their attack submarines would be equipped with Tomahawk, instead of only seven, as had been planned at one point. The British are committed to maintaining a nuclear submarine force and to integrating Tomahawk into their fleet. The rapid integration of Tomahawk provides credible striking power while the time-consuming conversion to large aircraft carriers takes place.

The British have the physical capability to support nuclear-armed Tomahawk missiles, if they should choose to seek and obtain this capability in the future. They have made long-term commitments to maintain a submarine force and nuclear weapons. The addition of the conventional Tomahawk missile makes the acquisition of nuclear Tomahawk a credible possibility since many of the logistic and support systems are similar. The only major new undertaking required might be the development of the ordnance package since the nuclear non-proliferation treaty prohibits the transfer of nuclear devices (whether the United States would transfer nuclear weapons to the United Kingdom or any other country, even in the absence of the NPT, is doubtful).

The government's announcement of its intention to acquire a sea-launched cruise missile capability raised several questions in Parliament. The Tomahawk acquisition was thoroughly debated. Its traditional role and potential mission growth areas were discussed. On July 13, 1995, a Member of Parliament asked whether the Tomahawk system would carry nuclear warheads.[13] Mr. Michael Portillo, the Secretary of State for Defence answered "we have no intention whatever of nuclear-arming that missile."[14] This was a predictable answer since the Trident program was just entering the final stages of completion, but Britain must eventually address the question of what will replace Trident. Britain is making a large investment in sea-based strike systems even as the United States and Russia are considering negotiating additional limitations on similar systems.

This thesis examines whether the nuclear Tomahawk might be a sensible option in the future for the British. The analysis will be accomplished by examining the military

[13] United Kingdom, House of Commons, Volume 263, Column 1093, 13 July 1995.

[14] United Kingdom, House of Commons, Volume 263, Column 1094, 13 July 1995.

.and strategic merits of the nuclear Tomahawk, comparing British requirements with solutions available in the nuclear Tomahawk program, and discussing the political factors that rule it out as an option for Britain, at least in the foreseeable future.

Chapter II initially addresses the theoretical basis for maintaining a sub-strategic system. The advantages of using naval systems, particularly submarine launch platforms, are explored. Chapter II also identifies the political, strategic, and operational requirements that a sub-strategic nuclear delivery system might fulfill for Britain. With the British requirements outlined, the next step is to examine the current status of the nuclear-armed Tomahawk in the United States.

Chapter III reviews the reasons why the United States has retained nuclear Tomahawk. It examines the 1993-1994 NPR and the ways the submarine force has implemented the policies defined by the NPR. The current technical status and the future of the system in the United States also are addressed. The purpose of these reviews is to identify all the advantages that the Tomahawk system has provided the United States and to determine the future of the system within the U.S arsenal.

Chapter IV compares the choice to adopt the Tomahawk from the British and American viewpoints. The comparison explores the advantages and disadvantages of choosing Tomahawk. The comparison throws light on whether the British might adopt Tomahawk in the future. It identifies the key factors that are likely to influence British decision-making.

II. SUB-STRATEGIC TRIDENT AND THE ROLE OF NUCLEAR TOMAHAWK

The fiscal and security realities of today have contributed to radical changes in the way that the United States maintains its military. In the past, large standing armies and navies maintained the capability to respond on short notice to the threat of attack. Response time could be measured in minutes. This level of preparedness is no longer required. Today, military budgets remain constrained, but the missions the U.S. military is expected to accomplish remain undiminished. The resulting combination of fiscal and political pressure resulted in the military community adopting the philosophy of assembling forces only when required. This process has manifested itself in various forms. Examples include the United States joint operations concept and Combined Joint Task Force concept. This concept, when applied to acquisition, results in smaller forces that can work together to accomplish a variety of missions vice large forces that consist of small, specialized units. Britain is undergoing a similar transition among its conventional and nuclear forces. Britain is the first of the nuclear states to consolidate its entire nuclear capability into one delivery system. The consolidation has altered the duties of the Royal Navy by introducing a sub-strategic mission for Trident. This chapter will examine the impact of the process on the British nuclear deterrent.

A. NEW MISSION FOR THE ROYAL NAVY

In July 1998, the British government completed its Strategic Defence Review (SDR), formalizing its intention to build a rapid deployment capability into its future naval forces. George Robertson, the British Secretary of State for Defence, described the radical change as necessary because "the world has changed out of all recognition since

the end of the Cold-War. We must now be prepared to go to the crisis, rather than have the crisis come to us."[15] The new rapid deployment capability is centered on the incorporation of aircraft carriers into the Royal Navy.[16] Britain's current naval aviation forces were intended to work in concert with the United States Maritime Strategy and provide only limited capabilities for close air support to land forces.[17] The new rapid deployment capability envisions obtaining two large aircraft carriers. Each carrier would have the ability to support approximately fifty fixed-wing aircraft.[18] The aircraft carrier will provide aircraft land-strike and support capability not available in the British fleet. This change in policy is based on the new requirement that Britain must be able to take the fight to any portion of the world, but the first of the new aircraft carriers will not be available until 2012.[19] Can the British meet their national security objectives with their current capabilities while designing and acquiring aircraft carriers?

The most difficult portion of this question revolves around the elimination of all nuclear weapons except those of the Trident missile fleet because no successor system to Trident has been identified. George Robertson recently explained to Parliament that "Since Trident should meet our needs well into the next century, there is no work under way to develop a new generation of nuclear weapons. No decisions on any successor

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[15] Gedda, George, "British Defense Plan Pleases U.S.", *European Stars and Stripes*, 21 July 1998, p. 1.

[16] United Kingdom Secretary of State for Defence, "A New Operational Concept for the Royal Navy," *Strategic Defence Review*, July 1998, Fact Sheet 21.

[17] United Kingdom Secretary of State for Defence, "Future Aircraft Carriers," *Strategic Defence Review*, July 1998, Fact Sheet 23.

[18] Ibid.

[19] United Kingdom Secretary of State for Defence, *Strategic Defence Review*, July 1998, Paragraph 115.

system will be needed for several years."[20] The SDR formalized several significant changes in the concept and operation of the British nuclear deterrent force. The nuclear warhead inventory will be cut in half, only one Vanguard Class submarine will be maintained on active patrol, a single augmented crew of 200 will eventually man each Vanguard submarine, and nuclear warhead loading will be limited to 48 per boat.[21] This reduction in nuclear warheads is consistent with the new Labour government's long-term commitment to progress toward elimination of nuclear armaments. Britain has removed excess fissile material from its nuclear weapons program and taken steps to make this material accountable to the international community.[22] British policies will leave the Royal Navy's Trident missile as Britain's only strategic and sub-strategic nuclear weapon delivery system. The new policy supporting the program is referred to as sub-strategic Trident.[23] Earl Howe, the Parliamentary Under-Secretary of State, Ministry of Defence, explained this new concept as follows: "a strategic nuclear strike would be an all-out nuclear attack. A sub-strategic strike would be an attack of a more restricted kind, perhaps against a specific military target. The difference is one of scale and purpose."[24] This concept has blurred the traditional distinction between strategic and sub-strategic missions in British nuclear policy.

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[20] United Kingdom, House of Commons, Written Answers, Column 200, Paragraph 52165, 28 July 1998.

[21] United Kingdom Secretary of State for Defence, *Strategic Defence Review*, July 1998, Paragraphs 77, 92, 115.

[22] United Kingdom Secretary of State for Defence, *Strategic Defence Review*, July 1998.

[23] United Kingdom Secretary of State for Defence, *Statement on Defence Estimates*, May 1996, Paragraphs 202, 203.

[24] United Kingdom, House of Lords, Oral Answers, Column 1138, 22 February 1996.

Why has Britain retained a nuclear weapon capability? Michael Quinlan postulates two reasons why Britain will maintain a nuclear force. First, the Trident program is virtually complete.[25] The large "up front" costs cannot be recovered and the sustaining costs, about one-percent of the defense budget, are relatively small. Second, nuclear weapons still provide Britain with some assurance that a major war will be deterred and they keep Britain involved in international security negotiations.[26] Quinlan postulates that the second reason is the true utility of nuclear weapons for the British. Until a substitute for the security insurance nuclear weapons provide is developed, they will remain an integral part of British diplomacy and policy making.

B. CHANGING ROLES

The traditional benchmark of using the delivery system to provide the distinction between strategic and sub-strategic weapons employment has been erased. Traditionally, sea-launched long-range ballistic missile systems have been used to deliver only the most powerful nuclear weapons at key targets. The British have, however, developed and deployed a variable-yield warhead for sub-strategic purposes.[27] The detection of an unannounced Trident missile launch no longer signals that a strategic nuclear response is in progress.

The early warning and intelligence systems of many states, however, may not be able to discern the "non-strategic" nature of the payload on the ballistic missiles. In

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[25] Quinlan, Michael, "Thinking About Nuclear Weapons," Royal United Services Institute for Defense Studies, Whitehall Paper Series, 15 October 1997.

[26] Ibid.

[27] Sublette, Carry, "Nuclear Weapons Frequently Asked Questions," Internet, Available from http://www.milnet.com/milnet/nukeweap/Nfaq7.html, Accessed 21 September 1998, Paragraph 7.2.3.3.

January 1995, the Russian ballistic missile early warning system detected a missile launch near Spitzbergen, Norway.[28] The detection caused the Russian military to implement its nuclear-response decision making procedures. It was determined that the missile did not pose a threat to Russia and no retaliatory nuclear action was initiated. The Russian government questioned why it was not notified of the launch. A review of the situation showed the Norwegians provided notification, but it was not properly distributed within Russian agencies.

The British conduct test launches of Trident missiles from the United States Port Canaveral Eastern Test Range.[29] The Russians might have conceivably mistaken these launches as hostile missile firings because no prior notification of British launches is required under Russian-United States bilateral agreements. This is an example of the type of confusion that might be generated as traditional strategic delivery systems assume sub-strategic roles. The United States is obligated to notify the Russian government of SLBM launches under the 1988 Agreement Between the United States of America and the Union of Soviet Socialist Republics on Notifications of Launches of Intercontinental Ballistic Missiles and Submarine-Launched Ballistic Missiles.[30] Presidents Clinton and Yeltsin, in September of 1998, reaffirmed their commitment to timely notifications and data

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[28] Phillips, Alan, "20 Mishaps That Might Have Started Accidental Nuclear War," Internet, Available from http://www.wagingpeace.org/nf/anw/index.html, Accessed 28 October 1998, p. 8.

[29] Naval Ordnance Test Unit Cape Canaveral, "U.K. Operations at Port Canaveral," Internet, Available from http://www.pafb.mil/tenants/notu/index.htm, Accessed 15 November 1998.

[30] United States Department of State, "Agreement Between the United States of America and the Union of Soviet Socialist Republics on Notifications of Launches of Intercontinental Ballistic Missiles and Submarine-Launched Ballistic Missiles," Internet, Available from http://www.acda.gov/treaties/balist1.htm, Accessed 06 November, 1998.

exchange concerning ballistic missile launches.[31] The new agreement, when finalized, will increase notification time to five days and provide a mechanism for other states to provide and share ballistic missile warning data. The British have no formal agreement with the Russians governing the testing and evaluation of ballistic missiles, but have agreed to provide Russia with five days notification of their Trident missile launches.[32]

The available geographic launch area for the Trident missile is much greater with sub-strategic Trident due to the use of only a single warhead sub-strategic payload. Dual capable aircraft previously constituted the only option available to the British to deliver sub-strategic weapons and to perform more limited nuclear missions. The British believe that today's relatively peaceful world has reduced the need for holding many large targets at risk to make deterrent threats. The excess capacity of ballistic launch systems can now be shifted to sub-strategic roles. Sub-strategic Trident missiles equipped with single warhead payloads allow Britain to hold at risk many more potential targets. When combined with a more robust aircraft carrier, sub-strategic Trident will give Britain a potent maritime attack force.

C. A BRIDGE TO THE FUTURE

To reinforce their conventional power projection capabilities, the British purchased the conventional torpedo tube-launched Tomahawk land-attack cruise missile

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[31] The White House, "Joint Statement on the Exchange of Information on Missile Launches and Early Warning," Available from http://www.pub.whitehouse.gov/uri-res/I2R?urn:pdi://oma.eop.gov.us/1998/9/2/16/text.1, Accessed 03 November 1998.

[32] British Broadcasting Corporation, "Britain to give Russia longer notice of Trident Missile Launches," ITAR-TASS News Agency, Moscow, 02 September 1998.

in 1996.[33] The SDR confirmed that the system would be incorporated into all fast-attack submarines. George Robertson explained that

> The overall cost of procuring Tomahawk for the Royal Navy is some 180 million pound sterling at 1997-98 prices. This includes the procurement of missiles, test and training systems, submarine weapon handling and fire control systems, and provision of a mission planning and targeting facility. In addition, the average of fitting out each submarine is estimated to be some 1.4 million pound sterling.[34]

The SDR indicates that the submarine force will consist of ten vessels and be modernized by purchasing more of the Astute-class.

Cruise missiles would be an effective weapon to accomplish British military objectives in many possible scenarios, but the choice of Tomahawk was based on U.S. demonstration of its utility. The Tomahawk cruise missile recently has been the United States weapon of choice for demonstrating military resolve. If the British have the same system, they can continue to respond in concert with the United States to deal with global security challenges. This is the true value of the Tomahawk system. It is a military link between political partners. The special relationship between the United States and Britain has been made stronger because Tomahawk increases the commonality of their military systems.

Since each submarine has five torpedo launch tubes, the British will have the theoretical potential to conduct a salvo launch of about 50 missiles.[35] British submarines do not possess a submerged vertical launch cruise missile capability. In practice, the

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[33] United Kingdom Secretary of State for Defence, *Statement on Defence Estimates*, May 1996, Paragraph 407.

[34] United Kingdom, House of Commons, Written Answers, Column 201, Paragraph 52172, 28 July 1998.

[35] Jane's Information Group, *Jane's Fighting Ships*, 1998, p. 752-755.

number of missiles launched in an operation would be lower than 50, because not all submarines will be available for operational service simultaneously. Additionally, only 65 missiles have been purchased by Britain.[36] Fifty missiles might not be enough to accomplish political objectives without the immediate backup of other strike forces.

Fifty missiles is much smaller than the 288 Tomahawk cruise missiles used in the opening days of the 1991 Gulf War. Fifty missiles is comparable to the 13 used by the United States in September 1996 during Operation Deliberate Force[37] or the 70 used in retaliatory attacks in August 1998 against international terrorists in Sudan and Afghanistan.[38] This suggests that by U.S. standards, the British have the capability to engage in only limited conventional cruise-missile strike operations. This could prove to be a weakness, especially if Britain was acting autonomously.

D. THE IMPORTANCE OF THE SPECIAL RELATIONSHIP WITH THE UNITED STATES

The nuclear Tomahawk might provide the additional deterrent credibility necessary to make a small conventional force more effective. In the past the United States and Britain have worked closely together in nuclear weapon development.[39] In 1958 the British successfully tested a thermonuclear weapon. Conducting independent nuclear warhead field tests was no longer required. The United States-United Kingdom nuclear

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[36] United Kingdom Secretary of State for Defence, *Statement on Defence Estimates*, May 1996, Paragraph 407.

[37] Atkinson, Rick, "With Deliberate Force in Bosnia," *The Washington Post Weekly Edition*, 27 November 1996.

[38] Kaplan, Fred, "New Tomahawk Missile More Accurate," *Miami Herald*, 21 August 1998.

[39] Pierre, Andrew, *Nuclear Politics: The British Experience with an Independent Strategic Force, 1939-1970*, p. 136.

partnership, which began during World War II, was reinstated. United States testing facilities were made available to Britain. This long heritage of nuclear sharing probably will be continued as Britain attempts to reorient the primary mission of its naval forces. The submerged launch nuclear Tomahawk would provide many advantages in a broad spectrum of policy areas that could strengthen the U.S.-British special relationship while bolstering Britain's ability to act independently or in conjunction with the United States and other allies.

The nuclear Tomahawk provides better crisis response and the ability to act autonomously to British forces. Autonomous action refers to maintaining a force system capable of posing a credible threat that can be effective without alliance or outside assistance. Crisis response is the ability to influence the actions of other nations with the effort being easily integrated into existing deliberate as well as contingency plans. The crisis response capability may provide the largest impact. Nuclear-powered submarines carrying the nuclear Tomahawk create a highly capable combination.

The role of the nuclear-powered fast-attack submarine is critical to Britain's future security. The British have made a long-term commitment to maintain their attack submarine force.[40] The British identified the fast-attack submarine's seven virtues as flexibility, mobility, stealth, availability, endurance, reach, and autonomy.[41] Budget planners often misunderstand the role of the fast-attack submarine, especially when compared to diesel electric submarines. The comparison is usually based on a cost

[40] United Kingdom Secretary of State for Defence, "Attack Submarines," *Strategic Defence Review*, July 1998, Fact Sheet 26.

[41] Patton, Jim, "Nuclear Attack Submarines", *International Defense Review*, Jane's Information Group Limited Special Report, 01 August 1995.

analysis. Some argue that the same missions can be accomplished with conventional powered submarines as with nuclear-powered submarines. This statement is true if coastal defense is considered the primary mission. The large "up front" cost of a nuclear fast-attack submarine force is difficult to justify if its operations will be limited to defending a state's coastal areas. But if long distance offensive operations constitute the primary mission, then a nuclear-powered submarine force is more easily justified.

In the British case the goal of going to the crisis is an offensive mission. If long-distance offensive missions are to be conducted, the cost of operating conventional submarines begins to approach that of nuclear submarines. With the costs virtually equivalent, the nuclear submarine becomes the vessel of choice. Offensive roles may not be politically aggressive, but they may nonetheless require the ability for maritime forces to monitor or influence the behavior of another state. The British have used their nuclear attack submarines in support of hostile action. British submarines played a intelligence and warning role in the Falklands War. They were able to observe Argentine land-based aircraft departing for strikes against transiting British naval and logistic assets. This early warning allowed some sea-based British aircraft to meet a few of the attacking aircraft before they could threaten the British fleet. The "up front" costs for infrastructure to support a fast-attack force have already been paid. The submarines are available to support the new offensive initiatives. The British presumably intend to exploit this investment, and they could strengthen it with additional weapon capability.

E. MAKING THE MOST OF TOMAHAWK

In a crisis, time for response might be measured in hours or days. The nuclear-powered submarine is uniquely capable of responding to crises. Nuclear-powered

submarines are designed to operate for extended periods of time with little or no logistical support. A submarine equipped with land-strike weapons has the capability to project power ashore in the early stages of a crisis until other forces arrive. A submarine with nuclear weapons provides even more options to the British National Command Authority.

A naval system's most significant inherent advantage is its mobility. With reduced budgets and limited forces, retaining or even improving strategic mobility is one of the keys to future success. Limited or reduced numbers of forces result in a higher value being placed on mobility because most forces have dual roles. This means that a single military element is assigned responsibility for several different contingency operations. For example, a submarine may be designed for use in NATO and British independent operations. These assignments are based on national strategy or international alliance commitments. Dual missions reduce the number of standing forces required for defense, but assume that the existing force can move to the crisis area. Naval systems and submarines in particular have already proven their mobility. According to James Tritten:

> Forward-deployed submarines can arrive in a crisis area rapidly and be positioned to launch unmanned surveillance systems and deliver shore bombardment prior to arrival of the Air Force composite wing or the Navy CVBG. It is the best platform for the rapid search and location of foreign submarines that must be identified prior to the introduction of an amphibious ready group. Simply put, the submarine can accomplish the limited sea superiority.[42]

Mobility can be offensive or defensive. Offensive mobility gives military planners the ability to position a fleet in an area of potential conflict. Repositioning a fleet or even

[42] Tritten, James, "The Submarine's Role in Future Naval Warfare," Naval Postgraduate School, Monterey, CA, 12 May 1992.

one ship is a clear signal of the government's intent. The act of using ships to influence events ashore has been referred to as "Gunship Diplomacy." In the past this meant controlling a port or enforcing a blockade. Today, Tomahawk missiles allow navies to engage in "Cruise Missile Diplomacy."[43] Submarines using cruise missiles can strike deep into critical areas as well as control ports or coastlines. Submarines can now take the fight well inland, far beyond the traditional area of the blockade.

By relying on Trident to perform sub-strategic missions, the British may have sacrificed a proportionate crisis response capability. Proportionate response is the ability to respond using a method that will be considered limited by the adversary and by other foreign observers. Attempting to respond in kind may help to limit escalation during a conflict. Preventing escalation may be a key advantage in the negotiating process. Proportional response can have many levels with a sea-based launch system. The response can be conducted in several steps that may be publicized to increase the effectiveness of the action.

The British can no longer deploy a single nuclear weapon to a local contingency. The current nuclear strategy depends on the Trident missile to deliver a sub-strategic payload. The British would have to deploy a Vanguard SSBN to the contingency area or reposition a deployed asset to cover the contingency. This approach has advantages and disadvantages. The advantages include the ability to deliver a relatively large warhead, the capacity to destroy deep or hardened targets, and the avoidance of dependence on

[43] Sparks, Timothy F., "The Dawn of Cruise Missile Diplomacy," Naval Postgraduate School, Monterey, CA, June 1997.

manned vehicles to accomplish the mission. These advantages could be helpful in some contingencies, but the disadvantages could become severe in other cases.

The major disadvantage with sub-strategic Trident is that national command authorities will have only a single choice of delivery systems, with some yield options. Limited choice means that more coordination will be required to leverage as much benefit from an action as possible. For example, local operations must now be coordinated with strategic planning for the SSBN force or contingency operation commanders must go out of theater to coordinate a nuclear response. The local commanders must be able to move friendly forces from a target area into which a Trident missile with a sub-strategic payload will be launched. Even if feasible, is this level of coordination desirable? This level of difficulty may make the Trident missile a less than satisfactory instrument for some sub-strategic nuclear scenarios.

F. FUTURE INTERNATIONAL NEGOTIATIONS

Britain's long term disarmament goal is the total elimination of nuclear weapons—and, indeed, general and complete disarmament—as called for by Article VI of the Nuclear Non Proliferation Treaty.[44] Britain took a bold step in the SDR by making its nuclear policy more transparent and planning drastic force reduction. To this point, major nuclear delivery system reduction agreements have been bilateral treaties between the USSR or Russia and the United States. The number of delivery systems held by the other nuclear powers has not been included in treaty limits. The START III negotiation

[44] United Nations, Treaty Series, "Treaty for the Non-Proliferation of Nuclear Weapons," 05 March 1970, Treaties and international agreements registered or filed or reported with the Secretariat of the United Nations, 250 (1956), no. 10485.

process could reduce the superpower inventory of strategic nuclear delivery systems to a level at which other nuclear power inventories would become a significant proportion of existing weapons worldwide. This change in relative numbers of delivery systems may necessitate the inclusion of all nuclear powers in future negotiations. By depending on only a single nuclear delivery system, Britain has reduced its ability to bargain in future arms control negotiations.

Britain could improve its negotiating position by fielding an independent sub-strategic system. An additional sub-strategic system would provide several negotiating benefits. It would allow the British to negotiate limits on their strategic forces in concert with the superpowers. As the United States and Russia eliminate strategic ballistic missiles, they may seek to have all nuclear powers give up the same capability. This step would be more feasible with shorter-range naval cruise missile systems already in place that would provide nuclear capability without the threat of global reach. Britain would not welcome an elimination of strategic ballistic missiles because its sub-strategic system has become an integral portion of its strategic force.

Sea-launched cruise missiles are not currently limited by any international treaty. However, in March 1997, the Presidents of Russia and the United States agreed on the following statement: " in the context of START III negotiations their experts will explore, as separate issues, possible measures relating to nuclear long-range sea-launched cruise missiles."[45] The potential of advanced strategic cruise missiles was recognized by

[45] The White House, Office of the Press Secretary Helsinki, Finland, Joint Statement on Parameters on Future Reductions in Nuclear Forces, 21 March 1997.

the superpowers when few nations had the ability to deploy such systems.[46] Many nations chose to pursue ballistic launch technologies because cruise missiles were expensive and could not deliver the desired payload in the required quantity. This combination resulted in two actions by many nations: pursue ballistic technology and develop weapons of mass destruction. This trend focused the effort of the superpowers on countering these technologies. Little effort was invested in countering cruise missiles. Technology improvements and reductions in costs have made cruise systems more accessible and affordable.[47] Past disadvantages such as limited range and poor accuracy have been overcome while costs have been lowered. The proliferation of cruise missiles will lead to renewed efforts to counter them.

G. AUTONOMOUS ACTION

The British intend to develop a Navy capable of providing a strong forward presence and the capability to strike land targets, if necessary.[48] To make this desire a reality, it must be able to act autonomously as well as in concert with allies or coalitions. Without the ability to act autonomously, there will be fewer scenarios in which its forward presence will be effective. Large aircraft carriers are a central element of Britain's strategy, but given Britain's current nuclear weapons policy, they can not provide nuclear strike capabilities. Britain cannot include nuclear weapons in its forward presence unless it assigns Trident missiles to such a role.

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[46] Huisken, Ronald, *The Origin of the Strategic Cruise Missile*, 1981, p. 29.

[47] Bender, Bryan, "Cruise Control", *Jane's Defense Weekly*, 22 July 1998.

[48] United Kingdom Secretary of State for Defence, "A New Operational Concept for the Royal Navy," *Strategic Defence Review*, July 1998, Fact Sheet 21.

Autonomous action requires several general capabilities. Given today's fiscal limitations probably only smaller forces will be available. Maintaining a large forward presence is expensive and may no longer be necessary. Warning time may be sufficient to reposition required forces to an area of concern. How much time would be available? United States strategy states "the first priority in the opening phase of a war would be to get U.S. forces to the fight in a timely manner. In many scenarios, U.S. forces would have no more than two weeks to get to the fight if they are to support an effective defense."[49] This philosophy necessitates a force that is built around naval systems, and able to move rapidly, deliver a wide variety of ammunitions, and most important respond proportionately. The British have addressed the naval force aspect and their nuclear propulsion program provides the ability to move rapidly. The ability to employ all types of munitions and respond proportionately requires further capabilities (such as nuclear Tomahawk) not programmed in future British naval forces.

Naval systems are inherently independent. Their autonomy makes unilateral action easier because negotiation with a host nation is not required. The UN Convention of the Law of the Sea formalized the freedom of all nations to operate vessels on the high seas.[50] Seven NATO European states provide facilities for U.S. nuclear-capable forces.[51] This arrangement is designed to serve several purposes, not just to demonstrate the U.S.

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[49] United States Department of Defense, "Annual Report to the President and the Congress", Secretary of Defense, April 1997, p. 22.

[50] United Nations, Treaty Series, "Treaty for the Non-Proliferation of Nuclear Weapons," 05 March 1970, Treaties and international agreements registered or filed or reported with the Secretariat of the United Nations, 250 (1956), no. 10585.

[51] Yost, David S., *U.S. Nuclear Weapons in Europe: Prospects and Priorities*, Defense Programs at Sandia National Laboratories, December 1996, p. 3.

commitment to support a NATO common defense. Britain does not currently have a similar role or arrangement. Keeping nuclear weapons only on naval vessels might, however, fulfill the predictable roles nuclear weapons will play for the British.

The presence of nuclear weapons might restrict the port access for vessels armed with nuclear weapons. This is a legitimate concern. The nuclear and conventional Tomahawks are similar in outward appearance. Physical verification of the type of warhead loaded on the cruise missile once the weapon is stored on a ship is very difficult. This is an advantage for the system overall because, if worst-case planning is used to construct defenses, all submarines must be assumed to carry nuclear weapons. This argument was valid in the past when many nuclear weapons were deployed at sea. Worst-case planning is no longer the norm as declining budgets have forced selections to be made based on plausible rather than possible threats. Today nuclear weapons are sometimes only effective, at least in some circumstances, if their presence is advertised.

This restricts the options the port host nation has when determining whether to grant ship visitation rights. The host nation may require certification from the visiting ship as to whether nuclear weapons are on board. A certification by the British that no nuclear weapons are on board might not be sufficient, and physical verification by the host would probably be politically impossible. The announcement of nuclear weapons deployment probably would not take place; therefore, the British would have to be ready to support their submarine fleet from their own facilities or those of the United States.

H. RESPONDING TO THE NUCLEAR CRUISE MISSILE THREAT

How might other states respond to the threat posed by cruise missiles? There are several factors in the cruise missile's favor. Cruise missiles can be deployed on multiple

mobile platforms. This complicates targeting vessels armed with cruise missiles; an enemy requires a system capable of locating and monitoring the platforms if their destruction is desired. Locating and monitoring submarines are expensive and difficult undertakings and have only been within the capability of the largest maritime powers. Fiscal constraints will ensure that few additional nations develop submarines armed with cruise missiles. The advantage is that any offensive system deployed on a submarine will maintain a high deterrent value during all phases of a crisis.

Once deployed, cruise missiles are difficult targets to locate, track, and destroy. Low flight altitudes and small radar cross sections make the weapons difficult to locate and intercept in flight. These qualities make loss of a missile a politically insensitive event because pilots are not placed at risk. To track cruise missiles, an advanced radar system is required with a configuration good enough to account for all variations in terrain or having a look down capability. Stealth can significantly improve the survivability of the cruise missile.

The British have defined the requirements for their future naval force. They have organized support systems and defined policies to maintain their current conventional security commitments. However, they may have overly constrained their nuclear arsenal. A single delivery system performing strategic and sub-strategic missions may be sufficient in the short term, but is not in concert with the policies of other nuclear powers. The nuclear Tomahawk could be a good choice to fulfill future British needs. What, however, is the status of the system in the United States today? Nuclear Tomahawk is a highly controversial system. Understanding the future of the system in the United States is critical before drawing any conclusions concerning the British.

III. THE ROLE OF TOMAHAWK IN UNITED STATES NUCLEAR POLICY

The Tomahawk is the premiere U.S. Navy land-attack missile deployed on submarines. The missile is capable of carrying a variety of warhead packages, but it is the only U.S. Navy cruise missile that can deliver a nuclear weapon. Due to a combination of fiscal circumstances, engineering constraints, and arms control negotiations, however, the future of nuclear the Tomahawk has become uncertain. Some argue that the system will never be used and should be eliminated, while others see it as the "weapon of choice" in response to an attack from an adversary using a weapon of mass destruction. This wide variety of opinions has created a debate about the future of the nuclear Tomahawk. This chapter examines the status of the nuclear Tomahawk in the United States and options for the future.

A. ARMS-CONTROL AGREEMENTS

Several arms control agreements limit nuclear cruise missiles. The Intermediate Range Nuclear Forces Treaty prohibited U.S. and Soviet (now Russian) ground-launched cruise and ballistic missiles with ranges between 500 and 5,000 km, and directed subsequent cruise missile development into sea- and air-launched variants. In conjunction with of the 1991 START I negotiations, the United States also made several concessions concerning sea-launched cruise missiles. The United States agreed to limit the inventory of nuclear sea-launched missiles, place no more than one nuclear warhead on each missile, and to provide Russia with information concerning nuclear sea-launched cruise

missile deployment.[52] Adopting a declaratory policy to support these commitments, the United States has "declared annually since 1992 that no nuclear SLCMs are deployed."[53]

In 1994, the Clinton administration directed the Department of Defense to reexamine the nation's national defense requirements. The Nuclear Posture Review (NPR) was described as the first major review of United States nuclear policy in fifteen years. The NPR made several recommendations covering all areas of nuclear policy. In terms of non-strategic nuclear weapons, the NPR recommended retaining the submarine-launched nuclear Tomahawk cruise missile. The Navy chose not to maintain the capability continuously in operation, but to reconstitute it as needed. Various factors have encouraged the Navy to reconsider the need for nuclear Tomahawk. The current debate over the future of the system is intense and could produce another full-scale nuclear assessment.

B. THE ORIGIN OF NUCLEAR TOMAHAWK

The strategic cruise missile was born when interest was renewed in air- and submarine-launched cruise missile following the signing of the first Strategic Arms Limitation Treaty (SALT I). Research and development was broadened to include all sea-launched cruise missiles, and the program was formally started on 2 June 1972. Simultaneously the United States Air Force was pursuing a cruise missile program, but the two services did not share technology until 1974 after the establishment of the Defense Systems Acquisition Review Council (DSARC). The two services maintained

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[52] DiOrio, David R., "The Role of Nuclear Sea-Launched Cruise Missiles in the Post Cold War Strategy," *The Submarine Review*, January 1998, p. 94.

[53] Ibid.

independent programs. On 6 January 1977, DSARC authorized full-scale engineering testing of air-launched, anti-surface, theater, and nuclear versions of the cruise missile. To further manage cruise missile development the Joint Cruise Missiles Project Office (JCMPO) was formed. Today it continues as the lead agency in cruise missile program management.

For the Navy, General Dynamics had the most successful test missile program. On 1 February 1977, it was awarded the first full-scale naval production contract. The General Dynamics missile was named Tomahawk. Initial production of the missile consisted of the Block 1 submarine-launched nuclear Tomahawk Land Attack Missile (TLAM-N). The Block 1 missile included an inertial navigation system, a terrain contour matching system, and was powered by the Williams International F107 turbofan engine. A digital processor in conjunction with the Inertial Navigation System guides it along a preprogrammed flight path to a target. The Terrain Contour system measures the actual land contour encountered in flight and a comparison is made to a stored profile. If the missile is determined to be off the preprogrammed flight path, a navigation correction is calculated and the missile is returned to the desired path. The missile has a range of 1,350 nautical miles and is equipped with a 200-kiloton warhead.[54] The relatively long range of the nuclear Tomahawk was achieved by extending the fuel tank.[55] The Tomahawk program produced an operational weapon when it deployed its first missile on board a Los Angeles class fast-attack submarine in November 1983. 758 nuclear Tomahawks

[54] Hooten, E. R., "RGM/UGM-109B/C 'TOMAHAWK'", *Jane's Naval Weapon Systems*, Issue 22, December 1996.

[55] Ibid.

were planned, but only 367 were produced and 32 were subsequently converted to carry a conventional warhead.[56] Production of nuclear Tomahawk continued until 1989.[57]

C. NUCLEAR TOMAHAWK'S ROLE

The Tomahawk was the product of a long research program to field a strategic cruise missile. The nuclear Tomahawk was intended to complement carrier aircraft in attacks against high value shore facilities. The nuclear Tomahawk in combination with other forces would create a formidable defense challenge for the Soviet Union. The nuclear Tomahawk was designed to penetrate air defenses that were too dangerous for piloted aircraft. Once Tomahawk had weakened or eliminated the air defenses, a clear flight route would be available for manned aircraft to deliver follow-on weapons.

The need for the nuclear Tomahawk was lessened when nuclear cruise missiles were incorporated into strategic bomber aircraft. The B-52 Stratofortress using the Air Launched Cruise Missile (ALCM) remains an integral part of the United States strategic force. ALCM allowed bombers to fire weapons while remaining outside the range of enemy air defenses. The number of weapons the Air Force could deliver was greater than that which the submarine force could deliver, and nuclear cruise missile missions were shifted from the Navy to the Air Force. This was not the end of nuclear Tomahawk, but a large portion of the missile's mission had been shifted to the Air Force.

The nuclear Tomahawk's greatest utility is as a highly survivable system. The basic concept was to place a small number of weapons on every naval ship. This would

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[56] Ibid.

[57] Ibid.

disperse the weapon inventory over a large geographic area. Certainly some of the weapons would survive any first strike and could be considered as a reserve force to stop or deter further aggression. The need for the system as a secure reserve force continued to diminish as additional survivable systems such as the Trident missile came into service. In September 1991, President Bush directed that non-strategic nuclear weapons be removed from naval vessels. This was a unilateral gesture to encourage the Soviet Union, soon to be succeeded by the new Russian Federation, to reduce its number of deployed non-strategic nuclear weapons. The future role of the nuclear Tomahawk remained in doubt until the NPR of 1994.

D. NUCLEAR TOMAHAWK TODAY

The use of non-strategic nuclear weapons is difficult to imagine in today's security environment. Some have hypothesized that a nuclear weapon might be used in response to a chemical or biological attack. Others have argued that precision-guided conventional munitions eliminate the need for non-strategic nuclear weapons. The non-strategic nuclear weapon was designed to be a force multiplier when first introduced in the 1950s. The United States and its NATO allies could not afford to produce and maintain a conventional army equal in size to the Red Army. The initial conception was that non-strategic nuclear weapons would provide the force necessary to contain the Soviets on the battlefield, The Alliance abandoned concepts of using nuclear weapons as battlefield instruments during the 1960s, and the new concept became one of limited and selective use for war-termination and the restoration of deterrence. Today there is no massive conventional threat to U.S. security. All these reasons have led some observers in the Navy to ask if there remains a need to retain nuclear Tomahawk.

The NPR examined America's nuclear weapon capabilities. The value and necessity of non-strategic nuclear weapon systems was debated. A premise throughout the decision process was that if a non-strategic nuclear weapon were needed, it would not be feasible to wait extended periods of time while the capability was redeployed. Arrangements were required to keep weapons ready for use to maintain the credibility of deterrent threats. The four options available to the NPR were dual-capable aircraft, submarine-launched nuclear Tomahawk, surface-launched nuclear Tomahawk, and carrier aircraft delivery. SLBMs and ICBMs were not considered as effective in the non-strategic role because of the difficulty in configuring the systems to deliver a single warhead, because the high warhead yields could cause significant collateral damage, and because the delivery method might not be distinguishable from a full-scale strategic attack. Cost also was a major consideration. Submarine-launched nuclear Tomahawk and dual-capable aircraft could be maintained without expending additional funds. Given the four choices available, the least expensive to maintain were the dual-capable aircraft and submarine-launched nuclear Tomahawk.

The submarine-launched nuclear Tomahawk has two system features that made its retention more palatable. The Tomahawk system uses the All-Up-Round concept. This refers to how the missile is handled after it is delivered to the vessel on which it will be stored until use. Virtually all maintenance procedures are performed at a land-based weapon handling facility, increasing the time between required maintenance inspections. This practice minimizes weapon transfer and handling duties, allowing more time for actual deployment in a ready-for-use status. The missile requires little or no preventive maintenance while deployed. The submarine's crew need only maintain proper storage.

When ready to use the missile, the crew simply needs to connect it to the ship's weapon control system. Some pre-launch monitoring and programming are required, but most of the procedures are computer-assisted. The process of loading and preparing the missile requires approximately 30 minutes.[58] No post-launch actions are required and the crew can literally fire and forget the weapon. This combination of improvements has increased the reliability of the entire Tomahawk missile system while reducing the workload of the submarine's crew.

The nuclear Tomahawk remains a torpedo tube fired weapon.[59] The submarine's crew and launching system require periodic certification. The torpedo tube is a thoroughly tested and proven launch system. Nuclear Tomahawk imposes some hardware requirements, but they are few and limited to nuclear weapon safety and security. The past practice was to maintain continuous nuclear certification. This process placed a great material and procedural burden on the submarine's crew since all critical systems had to remain certified for nuclear weapons. Since the return of all nuclear Tomahawk missiles to storage in 1992, the practice is to maintain a minimal level of readiness, and when required, to reconstitute full capability on specific individual vessels. The submarine, after making material preparations, would be certified for nuclear weapons and reassigned to duty as required. Thus, the capability exists to deploy submarine-launched nuclear Tomahawk, but there may be a time delay while the required preparations are completed. This process represents a trade off between what is required to keep the system available and minimizing the burden on the launch vessel.

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[58] Ibid.

[59] Ibid.

A new philosophy in submarine nuclear weapons control has been proposed: designing an independent control system that could be installed on any submarine. This allows the incorporation of modern control devices and eliminates the need to certify continuously the submarine's permanent weapon control and launching equipment for nuclear weapons. The system was originally referred to as the Portable Launching System, but it has been officially designated the AN/BGS-1. According to Michael Kostiuk, "this system consists of a laptop computer which will connect into the submarine's weapon control system and permit the shooting of a TLAM-N."[60] Special connection devices are tailored to the specific submarine weapon control systems and the laptop performs all the unique nuclear weapon functions. The system may simultaneously control multiple torpedo tubes. The system remains installed as long as the submarine is needed for nuclear-weapon service. The AN/BGS-1 has the look and feel of other submarine weapon control systems while incorporating commercial "off-the-shelf" technology. No additional crew or specialized training is required other than certification upon installation. The AN/BGS-1 eliminates many of the submarine-specific complexities associated with nuclear weapons command and control.

The 1997 Annual Report to the President and the Congress submitted by the Secretary of Defense reaffirmed that nuclear Tomahawk is required to implement the national security strategy.[61] In keeping with President Bush's 1991 promise not to deploy routinely nuclear missiles at sea, some submarines will maintain minimum operational

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[60] Kostiuk, Michael, "Removal of the Nuclear Strike Option from United States Submarines," *The Submarine Review*, January 1998, p. 85.

[61] United States Department of Defense, "Annual Report to the President and the Congress", Secretary of Defense, April 1997.

requirements so that, on relatively short notice, they can accept and deploy with the nuclear Tomahawk. For example, exercise Global Guardian in 1997 required a fast-attack submarine to be ready to use nuclear Tomahawk.

The nuclear Tomahawk cruise missile delivery body, unlike the conventionally armed Tomahawk cruise missile, has not incorporated new technology, e.g., the global positioning navigation system for better flight accuracy. Some current system operating funds have even been recommended for reprogramming to higher priority programs within the Navy. Similarly, the AN/BGS-1 designed to integrate the nuclear Tomahawk into virtually any submarine has been placed on a reduced production schedule. These actions will continue the nuclear Tomahawk program at minimal levels until a decision is made by the Secretary of Defense on whether to retain or eliminate the system.

E. ARGUMENTS FOR RETAINING THE NUCLEAR TOMAHAWK

The United States has made a long-term commitment to maintain the fast-attack submarine. The fast-attack force is estimated to consist of 45 to 55 fast-attack submarines in the year 1999.[62] The 1997 Antisubmarine Warfare Assessment to Congress stresses that it is important for the Navy to maintain the world's best antisubmarine warfare program.[63] This focus has resulted in the modernization of capabilities, owing in part to the incorporation of commercially available computer technology and software. This effort to strengthen the submarine force's computer and communication technology helps to ensure that the fast-attack submarine will remain a vital fighting element in the twenty-

[62] Ibid., p. 16.

[63] Holzer, Robert, "U.S. Navy Chief Emphasizes Need To Renew ASW Focus," *Defense News*, 3-9 August 1998.

first century. Currently, with the exception of NATO assets, the submarine-launched nuclear Tomahawk is the only in-theater non-strategic nuclear weapon available to the United States unified geographic combatant commanders in chief (CINCs). With the fast-attack submarine remaining in a lead war-fighting position and often forward deployed in support of Combined or Joint Task Force operations, it makes sense to retain a submarine-launched non-strategic nuclear weapon capability.

The submarine as a launch platform provides several additional advantages. Submarines can remain covert, can remain forward deployed for long periods, and can rapidly reposition. In this context, covert means to conduct national operations while remaining in international waters, but without disclosing the operation's existence. The submarine can be positioned to employ Tomahawk missiles without disclosing its presence. This has many advantages. It allows military preparations to be conducted in parallel with non-military efforts to resolve or prevent a conflict. Positioning submarines close to a conflict area reduces the response time if it is determined that a military action is necessary. Minimizing response time also minimizes the opportunity for the opponent to make defensive preparations. The submarine therefore improves the ability of the United States to respond quickly to a rapidly evolving situation—for instance, one involving an attack with weapons of mass destruction.

The submarine is designed for long-duration unsupported operations. Any vessel that forward deploys must have a support group to sustain it once in position. Logistical support can be more difficult than the actual operations. Submarines have traditionally conducted missions as independent units far from any logistic or repair facilities. The effort to maintain submarines as a long duration platform should encourage the use of

long duration weapon systems as well. Building a platform that can stay at sea for months in conjunction with abandoning or negotiating away sea-launched nuclear weapons seems to be a less than entirely coherent approach. The advantages of the submarine as a platform for sea-launched nuclear cruise missiles must continue to be exploited. Failing to do so less would waste the effort expended already to field such a sophisticated weapon platform.

Rapid repositioning of forces has a long tradition in modern naval planning. Efforts like building the Panama Canal and incorporating nuclear propulsion into aircraft carriers found their conceptual roots in the idea that U.S. naval forces would need to be moved to crisis areas from the four corners of the globe. Is there another way for the United States Navy to use its mobile forces to provide nuclear Tomahawk capability from the sea? The NPR recommended that the first four United States Ohio-class submarines be eliminated or converted to roles other than strategic nuclear deterrence.[64] These ships could be converted to Submarine Service Guided Missile Nuclear (SSGN) platforms.

The United States has proposed eliminating the first four Ohio-class submarines under START II.[65] This would reduce the number of SLBM launchers to bring the United States submarine force into compliance with START II limitations. The conversion rather than elimination of these four submarines would make good use of an asset that has significant service life remaining while simultaneously using advanced submarine technology to provide fire support to shore activities. They would provide mobile

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[64] United States Department of Defense, *Nuclear Posture Review*, 18 September 1994.

[65] United States Department of Defense, "Annual Report to the President and the Congress", Secretary of Defense, 1998, p. II-1.

platforms that could carry a large number of cruise missiles. It might also provide a nuclear Tomahawk capability that could act independently or in conjunction with conventional cruise missile strikes. Each ship might carry 144 Tomahawk cruise missiles.[66] The missiles would be housed in the existing launch tubes. This number of Tomahawk missiles on a single platform would make the ship the most versatile cruise missile launch platform in the United States fleet.

The conversion would also allow surface forces to concentrate on other missions, such as control of the sea, protection of aircraft carriers, or theater ballistic missile defense while in a littoral region. The current conventional Tomahawk missile competes for weapon storage space on board surface combatants. Operating in the world's littorals places these ships much closer to the land-based facilities of potential hostile nations. This proximity to land makes surface combatants much more susceptible to attack by aircraft or surface to surface missiles. By shifting Tomahawk missiles to submarines, surface combatants can better prepare to fight an air battle and have more weapons available that improve their ability to remain on station. As the theater ballistic missile defense role becomes a greater part of the surface ship mission, all options must be considered that improve air defense capability.

Including the capability to employ nuclear Tomahawk on the converted boats would take advantage of nuclear weapon design features already in the Ohio-class submarine. The ship was intended to house nuclear weapons. For example, the living and

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[66] Cote, Owen R., "Precision Strike from the Sea: New Missions for a New Navy," Second Annual Levering Smith Conference, MIT Security Studies Program, Internet, Available from http://web.mit.edu/ssp/www/publications/confseries/strike/strike_report.html, Accessed 16 October 1998, p. 14.

operational spaces are separated from the nuclear weapon storage areas. The mechanical control systems have features to prevent unintended access to compartments housing nuclear weapons, thus improving physical security. The trend in strategic arms systems is to shift to sea-based launch systems as well. This is demonstrated in the proposed START III warhead limits that result in the bulk of nuclear weapons being on submarines. Incorporating nuclear Tomahawk into the converted submarines would keep nuclear cruise missiles on platforms that are survivable and projected to continue service far into the future.

This concept leverages the strengths of all navy assets because few states have the capability to counter the SSGN concept. Any military threat to the SSGN would be addressed with air and surface assets that would be released from the Tomahawk strike role. Increased maneuverability for the surface forces in the littoral environment improves their mission capabilities as well. Since fewer aircraft would be required for the land strike role, more would be available for ship defense and undersea warfare. The concept takes advantage of the technological superiority of the Navy and increases the effectiveness of the entire fleet.

Rapid technological progress has made cruise missiles practical. Advances in electronics and the availability of smaller and lighter components have enabled manufacturers to develop accurate, long-range cruise missiles. The cost of such systems has been significantly reduced. The increasing availability of "off-the-shelf" fully ready cruise missile systems causes concern for the United States. According to a *Jane's* summary, the Pentagon's viewpoint is:

> The cruise missile threat stems from "first generation" cruise missiles, made from relatively cheap components and relying on low-technology guidance systems. Although, "the first generation is not that threatening," said a U.S. intelligence official, it is possible to outfit such missiles with weapons of mass destruction (WMD), including nuclear, biological and chemical munitions, and fire them at US forces or populated areas from a merchant vessel or aircraft. Cruise missiles may not be able to carry payloads as large as ballistic missiles, but the difference would be barely noticeable in the event of a WMD cruise missile attack. [67]

The cruise missile rather than ballistic missiles may very well be the global weapon of choice for warhead delivery. The proliferation of this high technology probably will cause cruise missiles to remain a significant threat to all U.S. forces and interests worldwide. The limiting or cancellation of fully developed programs like the nuclear Tomahawk under these conditions would be unwise. Accepting limits and restraints that are not enforceable or binding on others might place the United States at a considerable disadvantage. If the nuclear Tomahawk is required in the future, current decisions that are poorly conceived or based strictly on fiscal reasoning may have to be abandoned. Negotiations on a bilateral basis regarding this system should be suspended. Only when an effectively binding and enforceable agreement constraining the options of all powers can be reached should cruise missiles and especially nuclear cruise missiles be bargained away.

Planning of nuclear missions has been consolidated at the United States Strategic Command (USSTRATCOM). It is USSTRATCOM's responsibility to plan nuclear missions for the unified geographic combatant commanders in chief (CINCs). USSTRATCOM maintains the expertise and infrastructure to exploit the capabilities of all nuclear weapon systems. This consolidation was designed to eliminate duplication and

[67] Bender, Bryan, "Cruise Control," *Jane's Defense Weekly*, 22 July 1998.

to allow CINC commanders to concentrate on higher priority regional matters. It is a reasonable assumption that employing nuclear weapons would not be the first course of action in any crisis. It is for the unforeseen crisis developments that USSTRATCOM retains the ability to deploy support teams to assist a regional CINC should a non-strategic nuclear response be required. Nuclear Tomahawk remains the only non-strategic system that can be moved into a region without the need for a shore-based operational facility. If a CINC needs a weapon, it is most desirable to have it within theater and under his immediate control, although any employment decision involving nuclear weapons could only be made by the U.S. President.

The nuclear Tomahawk uses many of the same systems as its conventional counterpart. The Navy is not maintaining a unique nuclear Tomahawk targeting capability, but only retaining the ability to define and control nuclear missions when required. Equipment and personnel are employed in maintaining conventional Tomahawk on a daily basis. The nuclear planning capability has been placed in a reserve status similar to the weapons themselves. Nuclear missions are only defined as required to reduce the administrative and functional workload on the planning and control systems.

START III might actually allow the Russians to retain more non-strategic than strategic nuclear weapons. As the number of strategic nuclear weapons is reduced, non-strategic weapons become relatively more important because they comprise a greater percentage of the overall nuclear arsenal. START III would initiate the process of limiting total warheads vice launching systems, but currently is in doubt because of the Russian DUMA delay in ratifying the START II Treaty. The important point to consider is that the Russians have many more non-strategic nuclear weapons than the United

States. According to William Norris, "The United States is presently negotiating a treaty that would allow the other side to keep more non-strategic weapons than strategic weapons and that would seem to give the overall total ratio of around 6000 Russian to 3500 U.S. nuclear weapons."[68] These non-strategic weapons would provide a formidable threat without the United States nuclear arsenal as a balance.

Current treaties do not address the non-strategic nuclear weapon imbalance. Since nuclear Tomahawk is one of two remaining United States non-strategic nuclear weapon systems, consideration of the limitation of sea-launched nuclear cruise missiles or the elimination of nuclear Tomahawk worsens this imbalance. The elimination of nuclear Tomahawk would strengthen the Russian position by eliminating a threat that is virtually impossible to counter, while simultaneously reducing the U.S. non-strategic nuclear capability to one delivery system, dual-capable aircraft. Until the total number of Russian non-strategic nuclear weapons is reduced to a level comparable with the U.S. arsenal, the United States must retain nuclear Tomahawk. Nuclear Tomahawk is a credible system and helps retain a balance with the Russian non-strategic arsenal.

F. ARGUMENTS FOR ELIMINATING THE NUCLEAR TOMAHAWK:

The arguments for eliminating nuclear Tomahawk encompass many functional areas. Foremost is the desire of the Navy, with the exception of the SSBN force, to get out of the nuclear weapons business. Some observers have suggested that the unified geographic combatant commanders in chief (CINCs), the major commanders who would actually conduct operations in a conflict, no longer require the system to accomplish their

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[68] Norris, W. L., "What is TLAM-N and Why Do We Need It," *The Submarine Review*, January 1998, p. 81.

theater goals. The service mission is to train, organize, and equip to support the mission requirements defined by the CINCs. Some naval officers ask, why should the Navy provide a capability that the end user (the CINC) no longer requires?

The United States accepts the risks associated with placing nuclear systems on mobile platforms because the advantages gained far outweigh the risks involved. Nuclear propulsion systems were designed to survive for extended periods in a seawater environment. Special corrosion-resistant materials and operational designs limit the possibility of nuclear fuel escaping into the environment. This was a necessary design consideration since naval propulsion plants were expected to go into harm's way and their loss at sea could reasonably be expected. The loss of the USS *Thresher* and the USS *Scorpion* are the United States examples. These ships were lost during peacetime operations in areas that make salvage nearly impossible. The nuclear reactors aboard these vessels will remain intact and the heat sink provided by the ocean will ensure that they remain in a shutdown condition. Similar environmental design considerations are not present in nuclear weapons.

Nuclear warheads were never designed to survive exposed to a seawater environment. The assumption was that no weapons would be lost. A nuclear weapon at sea is, however, at risk of being lost. The loss is not associated with the weapon itself, but with the vessel that is carrying the weapon. If the fissile material in a nuclear warhead is released to the environment, the consequences might be just as devastating as if the device was exploded. The storage of nuclear weapons is a minor consideration when designing naval vessels. The risk of loss at sea is the major concern. This concern cannot be readily addressed. This loss factor is one that is accepted as a risk that must be taken in

order to take advantage of the benefits that a mobile naval system provides as a nuclear weapon launch platform.

Others argue that the nuclear triad is so effective that nuclear Tomahawk no longer adds to national security.[69] The triad, it is argued, provides all the benefits that are intrinsic to the nuclear Tomahawk.[70] Land-based intercontinental ballistic missiles provide for a short-warning response. Ballistic missile submarines provide a survivable delivery system. The B-52 and B-2 provide the ability to deliver single weapons and are capable of being forward deployed to signal intent. The START I and START II treaties place limits on the total number of delivery systems and apply only to the United States and Russia. When START II is fully implemented, the United States inventory of strategic nuclear warheads for START accountable delivery systems will be approximately 3,500. This will result in the nuclear Tomahawk inventory being about ten percent of the strategic inventory.[71] From this perspective, the nuclear Tomahawk is a duplication of capabilities provided within the nuclear triad.

Recent technical improvements have made the conventional Tomahawk a very accurate weapon. The Tactical Tomahawk program has superceded all other Tomahawk cruise missile modernization programs. Tactical Tomahawk should be operational in 2003.[72] Tactical Tomahawk will be sixty percent cheaper to produce than the current

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[69] Kostiuk, Michael, "Removal of the Nuclear Strike option from United States Submarines," *The Submarine Review*, January 1998, p. 86.

[70] Ibid.

[71] Ibid., p. 87.

[72] Dornheim, Michael and Fulghum, David, "New Tomahawks To Be Retargetable," *Aviation Week & Space Technologies*, 31 August 1998, p. 35-36.

torpedo tube-launched Tomahawk cruise missile.[73] Tactical Tomahawk will incorporate a forward looking camera for battle damage assessment, a ultra high frequency satellite link to relay television images and retargeting information, a lighter airframe, bladder fuel tanks instead of wet structure, a more jam resistant global positioning navigation system, and ring laser instead of mechanical gyros.[74] Tactical Tomahawk might save $400 million in life cycle costs.[75] These improvements and expected cost savings ensure the Tomahawk cruise missile remains an effective land strike weapon.

These improvements have not been applied to the nuclear Tomahawk. The circular error probable (CEP) or the area of uncertainty in which a weapon is expected to land, based on the capabilities and errors in the system design, is 80 meters for the nuclear Tomahawk.[76] The equivalent distance for the D-5 missile is 90 meters and the Air Launched Cruise Missile is 30 meters.[77] To maintain a non-strategic system that is less accurate than some strategic forces is irresponsible, some observers argue, since it appears the strategic forces could assume a dual role and provide all the same capabilities the nuclear Tomahawk provides.

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[73] Ibid.

[74] Ibid.

[75] Ibid.

[76] Flaherty, Ted, "Likely START II Nuclear Arsenals, 2003," Internet, Available from http://www.cdi.org/Issues/nukef&f/database/startab.html, Accessed 07 October 1998.

[77] Ibid.

Some argue that the nuclear Tomahawk competes with the Navy's other primary missions.[78] For submarines the primary mission is anti-submarine warfare. This judgement is debatable since few other nations can engage the United States submarine force on a large-scale basis. Some see the primary mission as deterring conflict. In a recent effort to reduce the burden on submarine crews a return to core mission or undersea warfare has been adopted. The nuclear Tomahawk takes up weapon storage space in the torpedo room that could be used for a torpedo or another undersea warfare weapon. The nuclear Tomahawk requires some special handling and security requirements. The security requirements are unique to nuclear weapons and are not routinely implemented when only conventional weapons are on submarines. These additional requirements constitute what is seen as the competition with the primary mission since nuclear weapons necessarily demand high priority at all times.

Another argument against nuclear Tomahawk is that all other nuclear planning (except for NATO) has been consolidated at USSTRATCOM. Nuclear planning has incorporated Joint procedures similar to the rest of the armed services. According to current U.S. nuclear planning doctrine, "When requested by a unified geographic combatant commander, USSTRATCOM will develop theater nuclear support plans."[79] The centralization process is considered by some to have reduced the likelihood that geographic CINCs would consider the use of non-strategic nuclear weapons.

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[78] DiOrio, David R., "The Role of Nuclear Sea-Launched Cruise Missiles in the Post Cold War Strategy," *The Submarine Review*, January 1998, p. 93.

[79] The Joint Chiefs of Staff, *Doctrine for Joint Theater Nuclear Operations*, 09 February 1996, p. IV-1.

The Navy must maintain a unique database for nuclear Tomahawk. USSTRATCOM supplies some basic initialization data for nuclear Tomahawk targeting, but the Navy must do the bulk of the work to define, distribute, and execute a mission. This involves unique equipment and procedures that are only maintained by the Navy. This unique equipment configuration is solely used to support nuclear Tomahawk. The need for this unique system is difficult for the Navy to justify given that other existing nuclear systems can provide a similar capability while using assets that are dedicated to a nuclear role.

Another argument is that the time required to reconstitute the nuclear Tomahawk may be excessive if compared to the requirements for response. The assigned submarine must first be certified to accept the weapon. The submarine must then transit to a storage facility and load the required weapons. The submarine must then transit to the operation area to place the nuclear Tomahawk within range of the desired target. The time required for this process may be longer than the available response times in a crisis. If the nuclear Tomahawk cannot be made available in accordance with expected timetables for deliberate planning critics ask, then why should it be maintained in the arsenal?

During the budget process, several attempts have been made to reduce funding for the nuclear Tomahawk program. The Office of the Secretary of Defense (OSD) during its review of budget proposals, however, directed a restoration of funding. OSD cited its reason as the role of nuclear Tomahawk in the current national nuclear strategy. The national strategy calls for the nuclear Tomahawk, but part of the Navy desires to reduce funding in anticipation of eliminating the system. The difference in priorities has

contributed to the stagnation of nuclear Tomahawk's capabilities. Funding has been available to maintain the system, but not to improve it.

The decision on the future of nuclear Tomahawk will be difficult. The purchase of the conventional Tomahawk by the British suggests that the Tomahawk system is considered valuable by other militaries. The advantages the system brings to the United States are significant; therefore, any decision must not be based on Navy requirements and preferences alone. Any decision concerning nuclear Tomahawk must be considered at the national policy level. Any national policy decisions must consider international repercussions. As the world becomes more interdependent and fiscal constraints force militaries to deal with plausible vice theoretical threats, increased sharing of technologies between allies may become more desirable. Proven reliable systems may be shared to ensure future security. Keeping national and international policy requirements in mind, the Navy should maintain the capability until nuclear Tomahawk is no longer considered an asset in the national nuclear policy; and the United States might well consider selling Tomahawk to the United Kingdom for use as a nuclear delivery system if the British decide to pursue this option.

IV. THE POSSIBILITIES OF U.S-UK COOPERATION REGARDING NUCLEAR TOMAHAWK

The most important variable in the future security of the United Kingdom and the United States is their inability to predict future security needs. Due to the absence of a peer competitor for the United States, fiscal constraints will probably determine which defense programs survive. The choice made by the British to pursue Trident contributed to the elimination of their air-delivered sub-strategic nuclear weapons. Fiscal pressures within the U.S. Navy also could affect nuclear Tomahawk. The military options available to both nations would increase if they pursued more cooperation in solving their security needs. Alliances like NATO and other security arrangements might benefit from the sharing of technology and procedures. Nuclear-capable Tomahawk missiles might be shared with Britain, although the nuclear warheads would have to be made in Britain, as with the Trident SLBMs.

A. OPTIONS FOR THE FUTURE

The determination of future requirements for any large bureaucratic organization is difficult. Organizations that accurately forecast requirements usually are the most successful. The process of forecasting is difficult for the military. The problem originates from the long time required to implement innovations in a peacetime environment.[80] Unlike a private corporation that can clearly define its purpose and control the many facets of its operating environment, the military must respond to crises and sometimes with no warning. Through entities such as the RAND Corporation and the Office of Net

[80] Rosen, Stephen P., *Innovation and the Modern Military: Winning the Next War*, 1991, p. 58.

Assessment in of the Department of Defense, the government has at times been successful in anticipating the future military needs of the nation.

The process of analyzing complex strategic questions is called Grand Strategy. The ability to step back and look at the entire picture has sometimes allowed the United States to focus on long-term goals and on shaping the future security environment rather than simply reacting to events. Steps in any policy area should be taken only after thorough deliberation and in the light of the nation's grand strategy. The United States has agreed to consider the possible limitation of sea-launched nuclear Tomahawk cruise missiles, but the United States evidently has no long-term strategy concerning the future of nuclear Tomahawk. The nuclear Tomahawk could be used in lieu of for gravity bombs, as a response to a rogue state or terrorist use of a weapon of mass destruction, or as a hedge reserve weapon. The United States should adopt a clear strategy concerning nuclear Tomahawk cruise missiles before considering any limitations.

B. THE POSSIBLE USE OF A NON-STRATEGIC NUCLEAR WEAPON

When might the United States consider using a non-strategic nuclear weapon? This is a difficult question to answer, given the accuracy and destructive capability of modern conventional weapons. The question must be answered before decisions are taken on the future of non-strategic nuclear weapons. The answer depends on the political and military requirements involved. U.S. military doctrine states that "the employment of nuclear weapons must offer a clearly significant advantage over nonnuclear munitions."[81] While debating the ratification of the United Nations Convention on Chemical Weapons,

[81] The Joint Chiefs of Staff, *Doctrine for Joint Theater Nuclear Operations*, 09 February 1996, p. III-1.

the U.S. Senate attempted to clarify when the use of non-strategic nuclear weapons might be considered. William Perry, then the Secretary of Defense, was questioned concerning the use of chemical weapons against United States military forces. Senator Pell asked, "If, God forbid, another country did stage a chemical weapon attack, what would be the response: Would it be—are you thinking in terms of nuclear weapons? Are you thinking in terms of conventional weapons? What would be the means of responding?"[82] Perry answered:

> We would not specify in advance what our response to a chemical attack is except to say it would be devastating. And we have a wide range of military capabilities to make good that threat.[83]

Because politicians are reluctant to rule out military options, they avoid defining the circumstances in which a non-strategic nuclear weapon might be used. This approach has been referred to as the strategy of "calculated ambiguity."

Non-strategic nuclear weapons might be employed as a possible response to the use of a weapon of mass destruction. This might be difficult or impossible if the responsible party cannot be identified. U.S. strategy toward weapons of mass destruction emphasizes preventing proliferation and maintaining capabilities that would diminish the value of their use by other nations. Part of America's deterrent capability resides in its non-strategic nuclear weapons. President Clinton addressed the proliferation of weapons of mass destruction in Executive Order 12938.

> I, William J. Clinton, President of the United States of America, find that the proliferation of nuclear, biological, and chemical weapons ("weapons

[82] United States Senate Committee on Foreign Relations, Hearing on the Convention on Chemical Weapons (Treaty Doc. 103-21), March 1996, p. 134-135.

[83] Ibid.

> of mass destruction") and of the means of delivering such weapons, constitutes an unusual and extraordinary threat to the national security, foreign policy, and economy of the United States, and hereby declare a national emergency to deal with that threat.[84]

President Clinton reaffirmed the importance of this executive order by extending its effectiveness and adding additional measures on 28 July 1998. The order contained diplomatic, commercial, and administrative remedies to respond to proliferation, but did not include military measures that might be considered.

The ambiguity in the political considerations for the use of a nuclear weapon is intentional. Statements such as "all available responses" or "devastating response" have been used to indicate that nuclear weapons could be considered without making a clear overt threat. Nuclear weapons are used as a tool to prevent war or to deter escalation to higher levels of violence. In the case of WMD, a non-strategic nuclear weapon might be used to prevent further escalation and the outbreak of a much larger general war. James Baker has described the condition as living with ambiguity.[85] According to Baker,

> The demise of the Soviet Union decreased the risk of global thermonuclear war while increasing the possibility of lesser, but still dangerous, regional conflict. International power has been diffused and international discipline loosened. Under these circumstances, the proliferation of weapons of mass destruction raises the possibility of a "New World Disorder" with a vengeance.[86]

The disorder that may result is exactly why United States nuclear policy must remain ambiguous. Ambiguity ensures that there will be flexibility in any policy position and

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[84] President of the United States, The White House, "Executive Order 12938 of 14 November 1994," Internet, Available from http://www.pub.whitehouse.gov/uri-res?urn:pdi://oma.eop.gov.us/1994/11/14/5.text.1, Accessed 16 October 1998.

[85] Baker, James A., "Selective Engagement: Principles for American Foreign Policy in a New Era," Address at The International Human Genome Summit Meeting, 21 January 1994, p. 3.

[86] Ibid.

eliminates hollow threats. Flexibility in strategy and the strength to consider all response options are the keys to coping with a turbulent security environment.

Employment doctrine should be unambiguous. Employment doctrine does not address when to respond, but how to respond once authorized and ordered to do so by civilian authority. The Joint Chiefs of Staff Doctrine for Joint Theater Nuclear Operations describes the possible enemy forces and facilities that might warrant a non-strategic nuclear military response. The possession or use of weapons of mass destruction is covered under non-state actors as well as state actors. Non-state actors and weapons of mass destruction, including their delivery systems, are described as "likely candidates" for the use of a nuclear weapon.[87]

The best choice today against these target types might be a single non-strategic nuclear weapon if the civilian National Command Authority determined that the use of a nuclear weapon was indeed necessary. The advantages offered by nuclear Tomahawk are that "heavily defended areas may be penetrated without risk to crew, highly mobile platforms in international waters serve as launch sites, weapons are highly accurate, launching platform is recallable, basing issues are simplified, and maximum stealth and surprise can be maintained prior to launch."[88] These advantages make nuclear Tomahawk the best weapon system choice to accomplish difficult non-strategic nuclear missions.

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[87] The Joint Chiefs of Staff, *Doctrine for Joint Theater Nuclear Operations*, 09 February 1996, p. III-6-7.

[88] The Joint Chiefs of Staff, *Doctrine for Joint Theater Nuclear Operations*, 09 February 1996, p. I-4.

C. SHARING OF TECHNOLOGIES

Why should any nation or military establishment want to share its military technology? Sharing of proven weapon systems could be a significant disadvantage for the United States since acquisition times can be very long for new systems. The technological advantage acquired during research and development might not easily be regained if lost. The key lesson to learn from the past is that military technology was not the essence of the national strategy. In the past, technology sharing was discouraged because some strategists believed that certain forms of competition between nations would benefit the United States. One of the objectives was to get the opponent to commit large portions of his available resources to wasteful types of military effort. In the 1980s this process was referred to as the Competitive Strategies approach.[89] Sharing military technology, even with U.S. allies, might be counterproductive, according to one interpretation of this theory.

Today, large military expenditures are not as easily justified. Since it is becoming clear that the money for extensive research and development is no longer available and that most countries cannot afford to compete directly with the United States or foreign adversaries, a method of sharing effective technology with our allies would provide the Alliance with advantages while limiting the cost of the venture. This process has been referred to as role specialization. If not all military capabilities can be maintained, allies in general would benefit by concentrating their individual efforts on specific types of capabilities and then performing the function on behalf of allies. Britain and the United

[89] Marshall, A.W., "Competitive Strategies-History and Background," Presentation at ADPA Symposium, Los Angeles, 17 February 1988.

States are best poised to share cruise missile technology and perform nuclear cruise missile duties for the alliance.

Past U.S. sharing with the British was successful in the area of weapon design and testing, notably with regard to the Polaris SLBM and the Trident D-5 missile. The United States government would not, of course, transfer nuclear warheads, but what about the required command and control and the auxiliary systems for planning, handling, and communications? The British own the conventional Tomahawk and have previously adapted their nuclear weapon designs to United States ballistic missiles. Could the AN/BGS-1 be shared with the British? The AN/BGS-1 or Portable Launching System is being developed as a control system for the nuclear Tomahawk. The system separates the control functions of the nuclear Tomahawk from the submarine's fixed weapon control system. These components provide the capability within the Tomahawk missile family to control a nuclear payload. A U.S. transfer of the combination of the missile airframe and the control system might be judged acceptable by U.S. political authorities if the British expressed interest in acquiring the TLAM as a nuclear delivery vehicle. Precedents have been set. The United States shared the Polaris and Trident D-5 missiles. The sharing of the nuclear Tomahawk system less the nuclear weapon components would be similar and might well be acceptable to U.S. political authorities.

D. IMPACT OF LIMITING SEA-LAUNCHED NUCLEAR CRUISE MISSILES

If the United States follows through with the March 1997 Helsinki Summit proposal to consider limitations on sea-launched cruise missiles, how could any limitations be verified on submarines? Would a bilateral treaty between the United States and Russia provide the basis for a future multilateral treaty? These questions have been

asked in the past and are even more relevant today as cruise missile systems proliferate. There were two proposals to resolve the verification issue. The first consisted of designing a monitoring regime intended to detect the presence of nuclear weapons being placed into a submarine.[90] The second was to adopt a declaratory policy to eliminate the need for on-site inspections.[91] President Bush postponed resolving the issue when he directed that nuclear weapons be removed from all U.S. naval vessels, but that action did not answer the underlying question of verifying negotiated constraints on nuclear-armed sea-launched cruise missiles.

Any inspection of United States submarines would be contrary to U.S. security interests because it would give access to vessels that require secrecy for effective operations. Any inspection of a submarine might disclose operating patterns, weapon load, and ship capabilities. The United States design philosophy of using a single ship type to conduct a variety of missions would be placed at risk. Russia, like the Soviet Union, has had specific submarines for cruise missile duty, so inspection of those platforms would not reveal as much information. Britain, like the United States, designs its submarines for several missions. The United States and Britain are today even more exposed. Force reductions have eliminated many special class submarines, and the fleets revolve around baseline commonality to take advantage of economies of scale in production and maintenance. The reliance on fewer submarines to accomplish required missions would make arms control inspections another unnecessary burden to place upon

[90] Yost, David S., "Controlling Sea-launched Cruise Missiles: The Most Difficult Question," *Proceedings*, vol. 115, September 1989, p. 62.

[91] Ibid., p. 63.

fleet operating forces. No inspection of a submarine to support a negotiated limit on nuclear cruise missiles would be consistent with U.S. national security interests.

The United States is relying on a voluntary declaratory policy covering nuclear sea-launched cruise missiles. Since 1992 the United States has made an annual statement to Russia on the status of its sea-launched nuclear cruise missiles.[92] The statements confirm that no nuclear cruise missiles are deployed on United States naval vessels. This has been done to assure the Russian government that President Bush's initiative is being fully supported. The intention is to convince the Russians to continue to not deploy their nuclear cruise missiles at sea. The policy has been successful and should continue. This arrangement allows the parties to retain nuclear sea-launched cruise missiles without having to conduct verification inspections.

Why do the Russians desire to limit U.S. sea-launched nuclear cruise missiles? The Russians since the early 1970s have raised the issue in almost all nuclear weapon negotiations. This is an important question because any treaty the United States negotiates probably will only be on a bilateral basis with the Russians. The provision in the Intermediate Range Nuclear Forces Treaty to exclude sea-based missile systems was only a temporary compromise. The Russians apparently reason that it would be vastly more difficult for them to defend against cruise missile attack, because they are less capable of detecting cruise missile platforms, both submarines and surface ships, than the United States. The United States has historically benefited from a technological advantage in submarine quieting. It was believed that Russian submarines could be

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[92] DiOrio, David R., "The Role of Nuclear Sea-Launched Cruise Missiles in the Post Cold War Strategy," *The Submarine Review*, January 1998, p. 94.

located before they were close enough to employ nuclear cruise missiles against the United States. Russian advances in submarine quieting have, however, produced a new generation of submarines that may be as capable as those in the U.S. fleet.

E. THE POTENTIAL BENEFITS OF NUCLEAR TOMAHAWK FOR THE UNITED KINGDOM AND THE ALLIANCE

The United Kingdom dedicates its nuclear forces to NATO assignments and maintains an independent nuclear decision making capability. Should the Alliance fail to reach a consensus, Britain could independently decide to employ nuclear weapons. NATO's current policy states:

> They [the Allies] will maintain adequate sub-strategic nuclear forces based in Europe which will provide an essential link with strategic nuclear forces, reinforcing the transatlantic link. These will consist solely of dual capable aircraft which could, if necessary, be supplemented by offshore systems. Sub-strategic nuclear weapons will, however, not be deployed in normal circumstances on surface vessels and attack submarines.[93]

This policy is in concert with the informal practice of the United States and Russia since 1991 not to deploy non-strategic nuclear weapons at sea.

What could the British accomplish with the nuclear Tomahawk? In the past, a key rationale for Britain to maintain a nuclear arsenal has been the "independent decision making" concept. This refers to the ability to use nuclear weapons without support from the United States, if necessary. Britain could assume a greater role in the nuclear security of NATO or eventually the European Union. The latter is not a popular proposal in Britain because it might weaken the special relationship with America. The British position on the "European" deterrent is best described as a commitment to a credible and

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[93] North Atlantic Treaty Organization, "The Alliance's Strategic Concept," NATO *Handbook*, October 1995, p. 248.

effective common foreign and security policy with a substantial contribution by the United Kingdom to the formulation and execution of agreed policies. The European Union as a single federated entity might have security concerns significantly different from those of the European Union today. It would need the ability to respond on a global scale. If the British took the lead and acquired the modern military tools necessary for global response, they might play a larger role in the eventual framing of a common foreign and security policy of the European Union.

If Britain maintains military commonality with the United States by adopting nuclear Tomahawk, it might better support the NATO nuclear deterrent and possibly the future European Union nuclear deterrent. Commonality is the key. Keeping pace with United States military technology is difficult and expensive. Britain, with its nuclear submarine force, is poised to maintain "on par" capability with the United States. British submarine commonality could be a key element in future military operations since Britain could always act in concert with the United States. Nuclear Tomahawk could offer Britain an advantageous method to maintain a sub-strategic nuclear deterrent in support of NATO and in close cooperation with the United States.

V. CONCLUSION

Nuclear weapons will remain an important component of United States and British foreign and security policy for the foreseeable future. America cannot continue to deter a nuclear threat "if it does not possess a retaliatory capability."[94] According to the British Ministry of Defense, "The SDR [Strategic Defence Review] has confirmed that in a changing and uncertain world, Britain continues to require a credible and effective minimum nuclear deterrent based on the Trident submarine force."[95] In another statement the British Ministry of Defense declared, "The measures of the Defence Review demonstrate the Government's clear and determined commitment to both strong defence and realistic work towards the ultimate goal of global elimination of nuclear weapons."[96]

Some observers have suggested that the actions outlined in the SDR may have reduced Britain's nuclear capability too quickly. The Trident system with the sub-strategic option, however, will meet Britain's current deterrence requirements. A decision on the requirements for the next generation British nuclear system is not yet necessary, but considering the great length of time required to develop and field new weapon systems, alternatives need to be identified to support a future decision. A future version of nuclear Tomahawk might replace or augment the Trident missile or provide a second nuclear delivery system in the British arsenal.

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[94] Chiles, Henry, "U.S. Nuclear Deterrent Needed in the Foreseeable Future," Testimony to United States Senate Armed Services Committee, 20 April 1994.

[95] United Kingdom Secretary of State for Defence, *Strategic Defence Review*, July 1998, Fact Sheet 22.

[96] United Kingdom Secretary of State for Defence, "Britain in the USA: Nuclear force reductions bring 50 million pound saving," Press Release, 30 July 1998.

The consolidation of all British nuclear weapons in the submarine force places them at sea in platforms that are highly survivable. The trend in U.S.-Russian START negotiations is toward fewer ballistic systems overall, but with a greater percentage of the remaining nuclear warheads deployed in sea-based systems. With the British submarine force as the only nuclear weapon service, the transition to nuclear Tomahawk on fast-attack submarines would be practical. The expertise in handling nuclear-armed ballistic missiles exists in the submarine force, and some of the same personnel could support both cruise and ballistic missile systems. Nuclear Tomahawk would augment a total weapon system that is already proven—submarine-based missiles.

Dual payload capabilities (conventional and nuclear) within a weapon system provide flexibility, allow for sharing, and reduce costs. The greatest overall advantage is that unique logistical facilities and equipment do not have to be constructed. The operational advantage is that existing launch platforms with some modification for command and control can be used. Nuclear Tomahawk uses many of the systems in place that already support the conventional Tomahawk missile. The operational use of the nuclear Tomahawk cruise missile by the fleet is virtually identical. The AN/BGS-1 Weapon Launch System is being designed to enable the nuclear Tomahawk to be deployed on any United States fast-attack submarine and to reduce the command and control burden associated with operating a nuclear weapon system.[97] This system or similar devices could hypothetically be adopted by the British to take advantage of

[97] Kostiuk, Michael, "Removal of the Nuclear Strike Option from United States Submarines," *The Submarine Review*, January 1998, p. 85.

research already completed by the United States, given the approval of U.S. political authorities.

Commonality with the U.S. nuclear delivery systems helps to guarantee that the British will remain interoperable in the future. Cooperation in the Trident missile project has kept British capabilities technically equivalent to those of the United States, except for some reported differences in the "front end" delivery packages and warheads. Some U.S. military observers fear that allies might not be able to incorporate the most modern technology and might then be unable to work in concert with United States forces. Sharing systems ensures a baseline of commonality. The United States and the United Kingdom could easily integrate future research and technical improvements into the British submarine fleet to maintain an equivalent Tomahawk capability in both the U.S. Navy and the Royal Navy.

Common systems make common training possible. Training together would strengthen combined joint efforts. The British might take a leading role in the Western European Union as a military force that can provide a link between United States tactics and technology and future European military force doctrine. Coalition action and cooperation in conflicts will probably increase in the future. Britain's lead in this area with the United States could make it an important player in organizing future similar arrangements with other nations.

The United States and Britain might also both deploy nuclear Tomahawk in converted Trident missile tubes. The British plan to acquire only enough Trident missiles to equip three SSBNs, a circumstance that implies that the fourth SSBN could be used for other purposes. Under the current START II proposals, the first four U.S. Ohio-class

submarines will be assigned other duties when the Russian Duma approves the START II protocols. Launchers on SSBNs currently dedicated to SLBMs might be modified to house conventional or nuclear cruise missiles. The conversion would use assets that are paid for and incorporate cruise missile technology. Cruise missiles appear to be the weapon of choice. The systems are relatively inexpensive, incorporate commercial "off-the-shelf" technology, and are supported by commercial research. This conversion would be applicable to British SSBNs if the British chose to adopt the system.

Nuclear Tomahawk is a mature system with a long pedigree of testing and experience. Frontline American military commanders and the President frequently ask where the Tomahawk shooters are when a crisis erupts. The President and his commanders might well ask for a nuclear Tomahawk shooter if the employment of a nuclear weapon was deemed necessary. It makes sense to retain systems that work rather than to invest in comparable new systems that might not have as much flexibility.

Sharing of nuclear-capable Tomahawk with the United Kingdom could provide benefits to the United States and the other allies. Fast-attack submarines are effective tools for the military and national command authorities and as such are deployed to the crisis areas of the world. Reducing their weapon capabilities in a world with an uncertain future would be shortsighted. The United States should retain nuclear Tomahawk and build on the tradition of the special nuclear relationship with the United Kingdom by supporting the sale of nuclear-capable Tomahawk cruise missiles to the United Kingdom if London chooses to seek this capability.

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